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The relations of the epochs, as conceived by the writer, are shown in the following scheme :

<i>Period.</i>	<i>Epoch.</i>	<i>Process.</i>
Pleistocene	Wisconsin . . .	Glaciation.
	Toronto ? . . .	Aqueous erosion, etc.
	Iowan . . . . .	Glaciation.
	Aftonian . . . .	Aqueous erosion, forest growth, etc.
	Kansan . . . . .	Glaciation.
Neocene	Ozarkian . . . .	Canyon cutting.
	Lafayette . . . .	Sedimentation.
	Tennessee . . .	Planation.

Save occasionally in the Appalachian and Piedmont provinces, where the normal land forms are locally dominated by structural mountains, monadnocks and catoclines, the topographic record of the two Neocene erosion epochs stands out in every typical landscape from the fall-line to the drift margin ; for the characteristic tabular or gently-rounded, residuum-mantled divides represent the earlier, and the no less characteristic steep-bluffed labyrinthine gorges represent the later epoch. The even-topped ranges and outlying monadnocks record earlier episodes in continental development, as Davis, Hayes, Campbell and others have shown ; but the record found in the relatively modern plateaus and gorges is many times the more extensive and impressive.

Howsoever the Ozarkian be classified, it is evident that the erosion epochs of the Pleistocene and Neocene were long, especially in the earlier time. Recent researches, notably by Chamberlin and others in the interior and by Salisbury in New Jersey, indicate that the Toronto epoch was much longer than the post-glacial epoch ; and it has for some time been recognized by a number of glacialists that the interglacial epoch called Aftonian was much longer, as measured by erosion, than all those that have followed—or, at any rate, that the Kansan was many times more remote than the Wisconsin. Yet the erosion of the Toronto and Aftonian together is trifling in comparison with the profound and

widespread canyon-cutting of the Ozarkian, during which the streams and larger rivers of the southeastern sub-continent cut gorges averaging 250 feet in depth and ranging from a few rods to several miles in width ; and even this enormous erosion is slight in comparison with the widespread wasting of the Tennessee epoch.

W J MCGEE.

#### CURRENT NOTES ON PHYSIOGRAPHY.

##### GEOGRAPHICAL DESCRIPTION OF THE BRITISH ISLANDS.

DR. H. R. MILL gives in the April *Geographical Journal* an account of his plan for a series of memoirs, one for each sheet of the one-inch ordnance survey, describing the geography of the British Islands in a most comprehensive manner. Index of names and locations, mean elevations, hypsographical description, physiographical explanation, areas of woodland, moorland, cultivated land, etc., political and historical boundaries and events, geographical description proper, and bibliography, are to be duly considered. The plan was favorably commented on at a meeting of the Royal Geographical Society, and it does not seem impossible that it may be carried into execution.

The remark made under 'historical information' might be applied to all parts of the plan : It 'would be very stringently edited, so as to confine it strictly to those features and events of direct geographical importance,' for an inspection of current geographical literature shows how vague is the prevalent conception as to the essential quality of geographical discipline. Local floras and faunas, one of the proposed topics, are distinctly not geographical, but biological subjects. Treated with relation to the controls of their distribution, they gain geographical flavor. Treated as exhibiting geographical controls, they become as distinctly geographical as are any other means

of impressing the facts concerning the earth's surface. It may be questioned whether the 'mean elevation of areas between successive contour lines' is a worthy object of geographical as contrasted with arithmetical study. It only produces confusion to tabulate under one heading a steep and a flat slope of the same limiting altitudes; but it is quite otherwise with the summation of steep and of flat areas, under appropriate but not arbitrary limits of height. A remark under this heading also might be generally applied to the whole project: "It would be very suitable as an exercise and training for students, if any institution existed in this country where students would be induced to study geography seriously." The geographical description "would be the most important part of the memoir, and must be the work of a trained geographer. \* \* \* It would deal directly with the relation of the people to the land, showing the control exerted by geographical conditions on the sites of towns, on dwellings, occupations, the distribution of the people, the lines of communication."

Let us hope that Dr. Mill's excellent project need not wait until that distant time when trained geographers are found, ready made; but that the Royal Geographical Society will at once announce that it is ready to publish chapters of these memoirs, by whomsoever prepared, but accordant with a systematic and comprehensive plan, and approved by a committee of editors. Almost any one of the chapters might be chosen as the subject for a candidate's thesis for his doctorate, and this kind of encouragement of serious geographical study might well serve as the thin end of the wedge that shall farther open up the proper development of geography in the English universities.

#### RECENT SHEETS OF OUR NATIONAL MAP.

THIRTY odd sheets of the topographical map, in preparation for our national geo-

logical atlas, are lately added to the growing list of surveyed areas. The limestone country of Florida is revealed as showing typical '*Karst*' forms, without continuous valleys, but discharging its surface waters by underground channels, entered through sinkholes. Although a faint relief, it rivals in perfection of this kind of form the more famous *Karst* district of Carniola. Kingfisher sheet, Oklahoma, exhibits a peculiar relation between Cimarron river, on the north, and the North fork of Canadian river, lying twenty miles further south and 300 feet higher; the branches of the former river heading within two or three miles of the latter and bidding fair to capture and divert it at various points. The downstream deflection of tributary streams is well illustrated in the case of Bird creek, which, when less than half a mile from the Cimarron, turns and flows six miles southeast along the margin of the flood plain before entering the main river, and indeed then enters it only because the river crosses to the southern side of its flood plain and picks the tributary up; thus repeating on a small scale the much larger example of the Yazoo and the Mississippi. The Oneida and Oriskany sheets, N. Y., might be commended to the author of the statement that "three distinct mountain masses enter New York from the south and extend across it in a general northeast direction." These sheets show in part the definite northern termination of the Alleghany plateau south of the Mohawk valley, in bluffs that ascend six or seven hundred feet. The second sheet includes the greater part of the 'long level' in the Mohawk valley, below Rome; of particular interest as the outlet of the expanded Lake Ontario in late glacial times. Many other sheets equally deserve comment.

#### A SHORT HISTORY OF THE GREAT LAKES.

UNDER the above title, F. B. Taylor is contributing several articles to the *Inland*

*Educator* (Terre Haute, Ind.) in the hope of cultivating an appreciative study of local physiography in the Indiana schools. In the April number, two outline maps exhibit hypothetical restorations of several stages of the glacial lakes in relation to the moraines, the retreating ice front and the temporary outlets. As several of the terminal moraines constitute the most important local reliefs of the level prairies of Indiana, and as one of the earlier lakes overflowed across northern Indiana to the Wabash and thence to the Ohio, passing the site of Fort Wayne, the subject is a pertinent one for an educational journal, and deserves more emphasis than it commonly receives in the schools. The Science department of the *Educator*, conducted by Prof. C. R. Dryer, of the State Normal School at Terre Haute, proposes to follow Taylor's essay with others of local physiographic bearing prepared by investigators of acknowledged competence, and in this plan they set a good example that deserves imitation.

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#### CURRENT NOTES ON METEOROLOGY.

##### WEATHER BUREAU KITE-FLYING.

THE past year has witnessed a very notable development in scientific kite-flying in this country. In Washington the Weather Bureau has, under the direction of Prof. Willis L. Moore, Chief of the Bureau, been carrying on an extended investigation into the best kinds of kites for use in sending up meteorological instruments. Prof. C. F. Marvin has recently minutely described the kind of kite now in use by the Bureau (*Mo. Weather Rev.*, Nov., 1895). This kite is a modification of those used by Hargrave in Australia, and is not at all like the ordinary kite. Instead of being flat, and tapering at the lower end, as in the usual form, these kites are box-shaped, with their ends open and their sides partly covered with

cloth or silk. This style of kite, which has also been in use at Blue Hill for some months, is found to be admirably adapted to the purpose for which it is intended, and when fine piano wire is used to hold it, instead of twine, is a splendid flyer. The next few years will undoubtedly witness many improvements in kites used for meteorological purposes, and the United States seems to be distinctly in the lead in this work at the present time.

#### BALLOONS AND KITES IN CLOUD OBSERVATIONS.

IN connection with the cloud observations to be made during the International Cloud Year (see *SCIENCE*, May 1, 1896, 661) the suggestion is made by Kremser (*Meteorologische Zeitschrift*, April, 1896, 143-144) that the extended use of small pilot balloons would result in giving us much valuable information as to the air currents in and around clouds. These balloons, which can be made at slight expense, reach considerable altitudes, and are especially useful in indicating the drift of the air currents when there are no clouds in the sky, the direction of the lower currents when only upper clouds are visible, etc. Clayton, of the Blue Hill Observatory, has for some time been using kites to help in determining the altitudes of the base of stratus and nimbus. These clouds, which so often cover the whole sky with a uniform sheet, can only have their heights determined under the most favorable circumstances if the ordinary theodolite is used.

##### BLUE HILL KITE-FLYING.

THE work done at Blue Hill Observatory with kites was outlined by Clayton before the Boston Scientific Society at a recent meeting (Boston Commonwealth, May 9, 1896, 12-13). The kites at present in use are the Eddy, or tailless, and the Hargrave, or box kite. Continued experiments at Blue Hill have resulted in the development